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ABSTRACT

Texas Schools, Inc. (TSI) developed a pilot program in bilingual education for Mexican-American vocational workers in the Department of Diesel Mechanics at Texas Tech University. This study assesses the transfer of technology in that environment using quantitative and qualitative measures. TSI, a technical and vocational school in Lubbock, Texas, operated from 1972 to 1992. The pilot bilingual effort consisted of a 6-month technical training and language development program. During the first 3 months technical classes were conducted in Spanish; during the last 3 months, in English. Spanish and English language classes were taught throughout the program. A total of 16 students were studied using the Canadian International Development Agency (CIDA) scale and case study interviews. The student questionnaire consisted of five questions dealing with the differences between the students' educational experiences in Mexico and in America; the instructor questionnaire addressed student differences and changes that could improve the educational climate at TSI. Results suggest: (1) students preferred a group approach to learning and a preference for laboratory practice, and looked to the instructor as a caretaker as well as instructor; (2) the teacher's agenda favored classroom instruction over laboratory instruction; (3) the norms, roles, agendas, and motives of the students and instructor came into conflict in their attempt to transfer technology successfully; (4) technology transfer did take place; and (5) CIDA scales are useful instruments for studying the transfer of technology whether the change agents are from the host or visiting culture. Contains 31 references. (LB)

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Texas Schools, Inc.--1

Texas Schools, Inc.: A Case Study
of the Transfer of Technology
at a Pilot Bilingual Program

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This paper is from the senior author's Master's thesis. Janet G. Metzger was the thesis chair. Robert A. Stewart and Roy E. Howard were committee members.

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Abstract

Texas Schools, Inc. developed a pilot program in bilingual education for Mexican-American vocational workers in the Department of Diesel Mechanics. This study assesses the transfer of technology in this environment using quantitative and qualitative measures.

Nine students in Group A had completed their first three months of training. The seven students in Group B had just begun training. For the Canadian International Development Agency (CIDA) scale scores (Hawes & Kealey, 1979) on Ability (A-G Scale), there was no significant overall difference between A and B ($t=-1.45$, df 11, $p<.05$); for the expectations (A-C Scale), B reported more positive expectations than A ($t=-3.63$, $df=12$, $p<.05$); for the feelings (A-D Scale), A reported more positive feelings than B ($t=5.16$, $df=14$, $p<.05$). In both the written theory and laboratory skills, B performed better than A. In a complex relationships, feelings and expectations of success were strong predictors of success.

Interview questions indicated that the norms, roles, agendas, and motives (Johnson, 1984) conflicted in the attempt to transfer technology. However, this conflict was ameliorated by a positive climate

including admiration and respect. This positive climate interacts with and informs the understanding of A's expectations. Respect for the instructor grows along with the realization of difficulty in teaching and in studying.

The triangulation in this study suggests that CIDA scales are useful instruments for studying the transfer of technology whether the change agents are from the host or visiting culture. This triangulation also suggests important ways that intercultural training must be developed in the vocational setting.

Introduction

Background

Nationally, the high school completion rate for persons 25 years or older in the general population is 76%; however, for Hispanics, the completion rate drops to 51.8%. For Hispanics of Mexican origin, the rate drops even lower--to 44.4%, whereas 63.4% of Hispanics of other than Mexican origin complete high school (Bureau of the Census, 1987). Concurrently, 32.4% of the Hispanics in the workforce are in low-income jobs, while only 19.4% of Hispanics hold technical, sales, and administrative positions. Only 7.8% of management positions are held by Hispanics (Bureau of the Census, 1983). This population, then, is clearly under represented in education and skilled labor.

In response to this situation, Texas Schools, Inc. (TSI) initiated a pilot bilingual program that endeavored to recruit Mexican and Mexican-American students for vocational and technical training. Texas Schools, Inc. was a technical and vocational school in Lubbock, Texas. The school operated from June, 1972, until its closing on February, 13, 1992. It was licensed and regulated by the Texas Education Agency,

Division of Proprietary Schools and Veterans Education. Accreditation came from the Southern Association of Colleges and Schools (Texas Schools, Inc., General Catalog, 1992). Coursework included: diesel mechanics, welding, vocational automotive, refrigeration/heating/air conditioning, collision repair, and electronic maintenance technology; business and medical programs had been added to the curriculum, but instruction had not begun.

At the time of its closing, TSI operated with forty employees. Administrative staff, admissions and financial aid, and support staff consisted of eighteen employees. The faculty consisted of twenty-two part-time and full-time instructors.

In May, 1991, As part of its recruiting efforts, TSI contacted the Bilingual/Multicultural Education Resources Center (BMERC) in the College of Education at Texas Tech University for assistance with their incoming limited English-proficient students. By July, 1991, the BMERC was in position as consultant for TSI in instituting the bilingual technical training program for the Diesel Mechanics Technology Department.

This pilot bilingual program was housed in the Diesel Mechanics Technology Department. Instruction in this program included technical training and language development. The course of instruction was based on a six-month technical training program. During the first three months technical classes were conducted in Spanish. Classes during the final three months were conducted in English. English and Spanish language classes were taught throughout the six-month period.

The first class of bilingual students began their program in June, 1991, and graduated in January, 1992. The second class began in October, 1991, and the third and final class began in January, 1992. The purpose of this paper is to explore the effectiveness of this pilot bilingual program.

Theoretical Perspective

The theoretical perspectives of intercultural training and intercultural competence provide useful information on training programs. However, the perspective used in this paper is the transfer of technology. This theory describes the mechanisms by which information is imparted across cultural boundaries.

Transfer of technology theory addresses the process of teaching and learning as it takes place between persons from different cultures. Hawes and Kealey (1979) define the actual transfer of technology as the capacity to transfer job skills. They go on to note that four personal factors contribute to the successful transfer of technology: professional qualifications, interpersonal skills, self assertion/identity, and realistic pre-departure expectations (p. 179).

Professional qualifications for this transfer of technology include commitment to the job, and technical background and skills. The interpersonal skills needed are flexibility, respect, listening skills, relationship building, calm and self-control, and sensitivity to culture. Self assertion/identity includes initiative, confidence, and frankness. Realistic pre-departure expectations are defined as a balance between recognition of the constraints of working in a foreign culture and optimism about success in the foreign culture (Hawes & Kealey, 1979).

This transfer of technology is a sharing that takes place between cultures, whether geographic or

organizational, as in the case of TSI. This process of sharing develops a third culture. Third culture is defined as "the behavior patterns created, shared, and learned by men of different societies who are in the process of relating their societies, or sections thereof, to each other" (Useem, Donoghue, & Useem, 1963, p. 169). Third culture building, then, occurs when two different cultures attempt to negotiate the ways in which they will interact together (Metzger, 1987). Knapp (1984, ch. 2) argues that this third culture develops whenever any two people interact. For example, as the instructor and students at TSI interacted, a third culture was developing.

The third culture (both geographic and organizational) that emerges in the transfer of technology can be explicated through an analysis of organizational culture. Johnson (1984) argues that communication is the process of organizing. Further, "organizing is a continual process by which relationships are accomplished" (p. 2). Specifically, she notes that communication creates the elements of culture, which are norms, roles, agenda, and motives (Johnson, 1981).

In order for the transfer of technology to take place at TSI, a third culture had to be negotiated between the Mexican students and the Mexican-American and Euro-American instructors. Norms, roles, agenda, and motives apply to the study of the bilingual program at TSI because they directly address the success or failure of the transfer of technology in the course of the training program.

A norm is expected behavior. Norms exist in educational and training settings as in any other setting. If students and instructors are made aware of the ways in which each expects the other to behave, the training process will be simplified.

A role is the part one plays in a particular situation. The role of students is that of learner, while the role of instructors is that of teacher. However, the ways in which these roles are expressed and carried out would be expected to vary from culture to culture.

An agenda is the order in which events are expected to occur. Educational agenda would also be expected to vary from culture to culture.

Finally, motives are the reasons for behavior. Understanding the motives of students will assist instructors in making any needed adjustments to teaching strategies.

Importance of this Project

The purpose of this study was to discover the strengths and weaknesses of the bilingual curricula developed by the BMERC for the Diesel Mechanics Technology program at TSI. In developing this project, two research questions were considered:

- RQ₁: Do the personal expectations and interpersonal experiences that classically define the transfer of technology influence the transfer of technology at TSI?
- RQ₂: How does the third culture at TSI influence the transfer of technology?

Analysis of Quantitative Study

Methods

Subjects

The respondents in the quantitative portion of this study were instructors and bilingual students in the Diesel Mechanics Department at TSI. The Diesel

Mechanics Department employed one bilingual instructor and one monolingual (English-speaking) instructor. The department also employed ESL and night class bilingual instructors, but they were not involved in this study. Also, the pilot group of students, who had already graduated, were not involved in this study.

The bilingual students in the day classes consisted of two groups. The first group (Group A) included nine students who began their study in the second wave of the program and moved from the initial three months of technical classes taught in Spanish to the secondary three months of technical classes taught in English.

The second group (Group B) included seven students who began their study in the third wave of the program and completed only three weeks of classes before the school was closed. Both groups of students received ESL training as part of their overall program at TSI.

The instructors were males in their mid-thirties. All the students were males ranging in age from 17 to 40 years, except one student, who was over 50 years old. The average age of the students was 26 years. All of the students were from Northern Mexico or from

Texas close to the border with Mexico. Spanish was their maternal language, and each was classified as having varying degrees of limited English proficiency.

All of the diesel mechanics students who were currently enrolled in the day classes, except one absentee, participated in this portion of the study. The students completed the CIDA instruments, and scores from their written theory and laboratory skills tests were obtained. Participants in the study received no payment for their participation. This study was approved by the Human Subjects Committee of Texas Tech University.

Instruments

The quantitative data for this study included the written theory and laboratory skills exam scores of the students, and an instrument that was developed by the Canadian International Development Agency (CIDA) to identify the components of overseas effectiveness and formulate a profile of effectiveness, based on an individual's characteristics (Hawes & Kealey, 1979). Three scales were extracted from the CIDA instrument: the Self-Ratings (A-G Scale), Personal Expectations (A-C Scale), and Personal Feelings (A-D Scale).

For this study, the wording of these scales was adapted to parallel more closely the population at TSI (Appendix A). For instance, when the CIDA measure referred to "the other culture," the current questionnaire referred to "the American culture."

Procedures

Both Group A and Group B completed the CIDA instruments during separate one-hour sessions. For each of the two sessions, the students were assembled in a classroom. The instruments were passed out to the students, and the bilingual instructor explained in Spanish and in English that the instruments were part of a study being conducted by Texas Tech University for the purpose of improving the bilingual training program. The instructor then explained the procedure for completing the instruments and left the room. The researcher remained to monitor the students and to answer procedural questions. Since English proficiency varied widely among the students, the more fluent students assisted the others with problems of translation.

Results

Research question 1 concerned the correlation between expectations and experiences, and the transfer of technology. For this study, the CIDA instrument was used to measure ability, expectations, and feelings; and test scores from written theory exams and laboratory skills exams were used to measure the transfer of technology.

Preliminary Analysis

Ability (A-G) Scale. Cronbach's alpha for the Ability (A-G) Scale of the CIDA instrument was originally .74. Reliability was improved to .81 by dropping Item 1 of this scale, Interaction with Americans. The intercorrelations among the remaining items of the ability scale are displayed in Table 1, Appendix A.

Expectations (A-C) Scale. Cronbach's alpha for the Expectations (A-C) Scale was originally .74. Dropping Item 4, Expectation to do Well in this Program, improved reliability to .81. The intercorrelations among the remaining items of the expectation scale are displayed in Table 2, Appendix A.

Feelings (A-D) Scale. Cronbach's alpha for the Feelings (A-D) Scale was originally .76. Item 5, Feelings about Speaking Another Language, was dropped, increasing reliability to .83. The intercorrelations among the remaining items of the feelings scale are displayed in Table 3, Appendix A.

Between-Group Differences

To test for differences between the two groups of students, (those mid-way through the program, Group A, and those just beginning the program, Group B), t-tests were performed for each of the three CIDA scales, and item-by-item for each scale. Also, t-tests were performed for differences between the two groups on the written theory and laboratory skills exam scores. Notable throughout these comparisons is the lack of deviations within the Group B scores. This may indicate that individuals in this group may have had no referent for answering the questions on the feelings scale. Thus, the obtained differences may have been spurious. Conversely, the lack of referents for responding to the items could indicate true differences between the two groups of students.

Ability (A-G) Scale. There was no significant difference overall ($t=-1.45$, $df=11$, $p>.05$) between Group A ($M=32.0$, $SD=6.91$) and Group B ($M=36.8$, $SD=3.03$). For Item 6, Accepting American Customs, Group B ($M=4.8$, $SD=.45$) had slightly more positive feelings ($t=3.21$, $df=12$, $p<.05$) than did Group A ($M=3.77$, $SD=.71$). For Item 8, Appropriate Background, Group B ($M=4.6$, $SD=.55$) reported a higher instance ($t=-2.29$, $df=11$, $p<.05$) than did Group A ($M=3.13$, $SD=.48$).

Expectations (A-C) Scale. For the Expectations Scale overall, Group B ($M=13.8$, $SD=1.1$) reported much more positive expectations ($t=-3.63$, $df=12$, $p<.05$) than did Group A ($M=7.22$, $SD=3.9$). For Item 2, Preparation Time, Group B ($M=4.4$, $SD=.89$) felt more positive ($t=-3.41$, $df=12$, $p<.05$) than did Group A ($M=1.78$, $SD=1.6$). For Item 3, Trouble Interacting, Group A ($M=2.0$, $SD=1.6$) had lower expectations of trouble ($t=-3.5$, $df=12$, $p<.05$) than did Group B ($M=4.6$, $SD=.55$).

Feelings (A-D) Scale. Overall for the Feelings Scale, Group A ($M=13.6$, $SD=3.24$) reported more positive feelings ($t=5.16$, $df=14$, $p<.05$) than Group B ($M=7.14$, $SD=.38$).

For Item 1, Work with English Speaking

Instructors, Group A ($\underline{M}=2.3$, $\underline{SD}=8.7$) reported more positive feelings ($\underline{t}=4.04$, $\underline{df}=14$, $\underline{p}<.05$) than did Group B ($\underline{M}=1.00$, $\underline{SD}=0$). For Item 2, Work with Spanish Speaking Instructors, Group A ($\underline{M}=1.67$, $\underline{SD}=5.0$) had slightly more positive feelings ($\underline{t}=3.5$, $\underline{df}=14$, $\underline{p}<.05$) than did Group B ($\underline{M}=1.0$, $\underline{SD}=0$). For Item 3, Work with Classmates, Group A ($\underline{M}=1.44$, $\underline{SD}=5.27$) had more positive feelings ($\underline{t}=2.21$, $\underline{df}=14$, $\underline{p}<.05$) than Group B ($\underline{M}=1.0$, $\underline{SD}=0$). For Item 4, Getting to Know Americans, Group A ($\underline{M}=1.89$, $\underline{SD}=6$) had more positive feelings ($\underline{t}=3.88$, $\underline{df}=14$, $\underline{p}<.05$) than Group B ($\underline{M}=1.0$, $\underline{SD}=0$). For Item 6, Learning New Customs, Group A ($\underline{M}=2.22$, $\underline{SD}=9.71$) had more positive feelings ($\underline{t}=3.30$, $\underline{df}=14$, $\underline{p}<.05$) than Group B ($\underline{M}=1.0$, $\underline{SD}=0$). Finally, for Item 7, Interacting with Americans, Group A ($\underline{M}=1.89$, $\underline{SD}=9.28$) had more positive feelings ($\underline{t}=2.51$, $\underline{df}=14$, $\underline{p}<.05$) than Group B ($\underline{M}=1.0$, $\underline{SD}=0$).

Exam Scores. In both the written theory and laboratory skills exams Group B performed better than Group A. Written theory exam scores for Group B ($\underline{M}=91$, $\underline{SD}=7.7$) were considerably higher ($\underline{t}=-4.8$, $\underline{df}=11$, $\underline{p}<.05$) than for Group A ($\underline{M}=67.9$, $\underline{SD}=8.9$). Laboratory skills

exam scores for Group B ($\bar{M}=95$, $SD=0$) were also considerably higher ($t=-4.04$, $df=11$, $p<.05$) than Group A ($\bar{M}=83.28$, $SD=7.06$).

Discussion

CIDA Scales

Correlation coefficients for the five variables of interest to RQ_1 are displayed in Table 4, Appendix A. The results of this study suggested that the more one engaged in interpersonal interactions the greater was one's perceived ability to function within a foreign culture. As Hawes and Kealey (1979) pointed out, interpersonal skills are one of the four requisites for successful transfer of technology.

Second, the higher were one's expectations for success, the fewer concerns he or she felt about performing in a foreign culture. This corresponds with Hawes and Kealey's (1979) assertion that positive but realistic expectations of success are necessary for the successful transfer of technology.

Finally, the more positively one felt about engaging in interactions, the more positively one felt about performing in a foreign culture. Again,

interpersonal skills are necessary for the successful transfer of technology.

As explained earlier, the CIDA instrument was used in this study to determine predictors of success within a foreign culture. Written theory and laboratory skills exam scores were used to determine the extent to which the transfer of technology had been successful. As might be expected, written theory exam scores and laboratory skills exam scores were closely related to each other. The factors from the CIDA scales that were related to laboratory and written theory exam scores were expectations and feelings. Expectations were positively correlated with success as defined by high exam scores, but negatively correlated with success as defined by the amount of the program completed. Feelings were negatively correlated with success as defined by high exam scores, but positively correlated with success as defined by the amount of the program completed.

Since the factors of the feelings scale are indicators of interpersonal skills, this agreed with Hawes and Kealey's (1979) contention that interpersonal

skills and positive but realistic expectations are necessary for success.

Exam Scores

In this study, Group B performed better on both written theory and laboratory skills exams. Written theory exam scores were particularly higher for Group B than for Group A.

Results from this study suggest several differences between Groups A and B. First, Group B's higher scores on the ability and expectations scale may be linked to actual experience. Since Group A had been participating in the program at TSI three months longer than had Group B, Group A's scores may reflect a more realistic response than Group B's scores. Also, Group B's superior performance on exams may be connected to the level of difficulty of the material. Again, since Group A had been enrolled in the program three months longer than Group B, the material covered by Group A would be more advanced and difficult than the material covered by Group B.

Analysis of Case Study

Methods

Subjects

The subjects in the case study portion of the study were also members of the Diesel Mechanics Department at Texas Schools, Inc. (TSI). Four students and one instructor were interviewed. By request of the lead instructor, the students who participated were the students with the highest and lowest scores in their class. The lead instructor also requested that four students from the older more experienced group, Group A, be interviewed, instead of only two--the two with the highest scores and the two with the lowest scores--as well as the highest and lowest students from the younger less experienced group, Group B.

Instruments

The case study portion of the study was a series of interview questions devised to answer the second research question. The questions were used to determine the perceived differences between American education procedures and Mexican education procedures, and how the learning experience of Mexicans in the United States can be strengthened (Appendix C).

Procedures

Interviews were conducted anonymously; no identifying information about subjects was given. Each interview consisted of one thirty or forty minute session. Interviews were conducted one-on-one between the interviewer and interviewee, except that the help of a translator was necessary in interviewing students who primarily speak Spanish and whose English-speaking abilities were, as yet, limited. The translator was a member of the EMERC staff working at TSI.

Students were admitted to the interview room individually. The translator explained to each one that the information they gave would be completely confidential and that it would be reported without any identifying details.

Results

Students

The student questionnaire consisted of five questions dealing with the differences between the students' educational experiences in Mexico and their educational experiences in America. The final question asked what changes could be made at TSI that would improve the program. In the following paragraphs,

"Students 1" refers to the students with the highest scores; "Students 2" refers to the students with the lowest scores.

Question 1 was, "When you first started at TSI, are there things that your American instructors at TSI did that were different from what your instructors did in Mexico? Explain."

Students 1 responded only that, of course, the language was different--their American instructors spoke English and their Mexican instructors spoke Spanish. Students 2 responded that American instructors spent less time covering the material than did Mexican instructors.

Question 2 was, "When you first started at TSI, are there things that your Mexican-American instructors at TSI did that were different from what your instructors did in Mexico? Explain."

Students 1 again noted language differences, this time in dialect. The Mexican-American instructor spoke "Tex-Mex" (the local dialect) instead of the Mexican dialect the students speak in Northern Mexico. They reported that their rapport with the Mexican-American instructor was such that they could joke with him about

this and correct his "bad Spanish." Students 2 responded that the Mexican-American instructor covered the classroom material (theory) fewer times and in less detail than did their Mexican instructors.

Question 3 was, "Are there some things you wish your American instructors at TSI did differently? Explain."

Students 1 felt that the program needed more instructors and at least one laboratory assistant. Students 2 also felt that all instructors should be bilingual and speak at least a little Spanish, and that the instructors should pay equal attention to everyone (this answer is clarified in answers to question 4 regarding the problems arising out of the arrival of the third wave of students, Group B).

Question 4 was, "Are there things you wish your Mexican-American instructors at TSI did differently? Explain."

Students 1 stated that the program needed more instructors. They also expressed great appreciation for the Mexican-American instructor, but felt that he had too many responsibilities to give adequate attention to his teaching duties. They also said that

since the new class had arrived, the instructor had spent most of his time teaching Group B, which meant that Group A was not receiving enough attention and instruction.

Students 2 were concerned with three staffing problems and one problem with materials. The three staffing problems were: (1) the need for more instructors, (2) the need for separate classes for Group B, and (3) the need to treat everyone equally (give equal attention to Group A students and Group B students, instead of spending more time with Group B than with Group A). The concern with materials was in regard to the use of charts picturing diesel parts and troubleshooting techniques for each, an instructional method used in Mexico but not at TSI.

Question 5 was, "What could TSI do to better meet your educational needs?"

The high students' responses could be grouped into three categories: language, laboratory, and staffing. The final category was a restatement of the need for more instructors. The low students' responses could be grouped into four categories: language, laboratory, staffing, and time.

Students 1's concerns were as follows. The language category had three points. First, that their initial text was in English. Since the first three months of their technical instruction was to have been in Spanish, this was a definite drawback. Second, that they were later provided with a Spanish edition of the same text, but that this edition was significantly less detailed than the English edition. Finally, that the exams were written in English. The students were allowed to answer in Spanish, but they pointed out that some of the technical terms were different in Spanish.

The laboratory category had five points. First, that there were too few components for the students to work on, and that, second, the components that were available all had missing parts. Third, there were so few components for so many students that organization was a problem, and the components and parts got scattered around the lab. Fourth, that the testing equipment was out of calibration, so that even when they were able to repair engine components they were not able to test their results. Finally, that the time they were able to spend in the laboratory was inadequate.

The two low students' concerns were as follows. The language category concerned ESL training. They felt that the method being used was inadequate--that they were not learning enough English.

The laboratory category had three points. Like the highest students, they felt that (a) there were not enough components available, (b) the components available all had missing points, and (c) there was no organization because too many people were trying to work with too few components. The staffing category was again a restatement of the need for more instructors.

Finally, the time category had two points. First, that six months (which is the length of the technical courses at TSI) was inadequate to learn all the material they needed to learn to be prepared for the job market. Second, that the administration was continually calling them out of class to take care of paperwork. Since this involved a one-hour round trip walk to the main campus, they regretted the lost instructional time.

Instructor

The instructor questionnaire consisted of three questions addressing the differences between American students and Mexican students, and changes that could be made that would improve the educational climate at TSI. Question 1 was, "When the bilingual students first started at TSI, were there some things they did differently from American students? Explain."

The answers to the first question concerned question-asking behaviors, and had three parts. First, the Mexican students were always in a "bunch" discussing what went on in the classroom and helping the slower students understand the lesson; American students went off on their own. Second, Mexican students were more hesitant to ask questions than American students. They would form groups, discuss the question in the group, and then, if no one in the group knew the answer, they would choose a spokesperson who would ask the question of the instructor. Usually, the group would hang back, and only the spokesperson would approach the instructor. However, if the question were pressing or urgent, the whole group would approach. The instructor speculated that this gave the

spokesperson more speaking power. Finally, when questions were asked one-on-one, they were generally posed after class, not during class.

Question 2 was, "Are there some things you wish your bilingual students did differently? Explain."

The instructor responded that he wished the students had "been more open as far as telling him their actual thoughts." The students would "hold back" when he asked a question. He suggested that this was because the student being asked to answer was fearful that everyone except him knew the right answer, and he would give the wrong answer.

Question 3 was, "Are there some things the bilingual students could do to improve the educational climate? Explain."

The answer to Question 3 had two parts. First, that the students could have been more open to making suggestions. Second, that they could have shown more willingness to accept new concepts from people other than this instructor.

The instructor's responses to the questionnaire were chiefly concerned with behaviors. To Question 1, he responded with comments about question-asking

behaviors. To Question 2, he responded with remarks about question-answering behaviors. Finally, to Question 3, he responded with observations about loyalty behaviors.

Comparison between Students and Instructor

Student responses to the questionnaire focused on abstracts. They concerned language differences, problems in the laboratory, amount of time for instruction, and staff shortages. As noted, the instructor's responses focused on three sets of behaviors: question-asking behaviors, question-answering behaviors, and loyalty behaviors.

Discussion

The case study portion of this study was designed to answer the second research question: how third culture influences the transfer of technology, especially how norms, roles, agendas, and motives develop that either enhance or impede the transfer of technology.

The Mexican students' norms can be seen in their question-asking and question-answering behaviors. According to the instructor, the students would "bunch

up" in groups and discuss items from his lecture that they did not understand. Speaking up in class or coming directly to him were not the norm. Their reticence was also apparent in their reluctance to answer questions in class.

The students' expectations of roles in this study were three-part. First, were the obvious learner and teacher roles. Second, were the roles played by quicker and slower students. According to the instructor, the students discussed their questions among themselves. In this group, the quicker students took on the role of teacher, while the slower students kept the role of learner. Finally, one person from the group was chosen to fill the role of speaker for the group.

The students' agenda showed preference to laboratory practice. They apparently wished to spend more time in practicing diesel engine maintenance than in learning diesel engine theory.

Motives for the students were related to the achievement of their educational goals. Their desire for more instruction time, more laboratory time and equipment, and more attention from the instructor were

motivated by their desire to learn enough about diesel mechanics to enable them to apply their knowledge in the workforce.

Norms for the instructor were apparent in two areas. First, extensive one-on-one instruction was not a norm. Students were expected to pick up most of the technical information from lectures. Second, the instructor expected the students to be more willing to ask and answer questions in class than they were. Reticence was not a norm for the instructor.

The role played by the instructor surpassed that of teacher. As the instructor stated, the students refused to accept new concepts from anyone except him because they thought he would give them more attention. This indicates that, to the students, he took on the role of caretaker as well as teacher.

The instructor's agenda favored classroom instruction over laboratory instruction. More time was spent in theory and language development than in laboratory practice.

The instructor's agenda suggests that he was motivated by a desire to insure that his students understood the theory behind the workings of the diesel

engine. Spending more time in the classroom as opposed to spending more time in the laboratory emphasizes the learning of theory over skills practice.

The norms, roles, agendas, and motives of the students and instructor came into conflict in their attempt to successfully transfer technology. This was indicated by their apparent frustration in responding to the interview. The students chose to follow the norm of group discussion; the instructor wanted the students to adhere to the norm of speaking up in class instead. The students wanted the instructor to assume the role of caretaker, while the instructor wished instead to completely fulfill his role of teacher. The students' agenda favored practice over lecture, while the instructor's agenda was the opposite. Finally, the students were motivated by the desire to learn practical application of diesel engine theory by working in the laboratory, whereas the instructor was motivated by the desire to teach them theory.

Development of the third culture at TSI showed a great deal of conflict between the norms, roles, agendas, and motives of the students and those of the instructor. However, as was seen from the results of

the quantitative study, the transfer of technology was successfully taking place. At least three factors may account for this. First, since the students who had been at TSI the longer period of time had still only been there for three months, the third culture was still nascent. Second, as seen from the results of the quantitative study, the students' interpersonal interactions were generally positive. If, as Hawes and Kealey (1979) contend, positive interpersonal interaction is a factor in achieving the transfer of technology, the positive overtones to the interactions of the students and instructor indicate a strong potential for the successful transfer of technology. Finally, both the students and the instructor seemed sufficiently motivated toward the accomplishment of the transfer of technology to continue the difficult task of building a constructive third culture. The transfer of technology takes place more successfully in a positive atmosphere than in a negative atmosphere. This positive atmosphere is described by Johnson (1984) as a positive "climate," or a "pattern of how people talk to [interact with] one another..." (p. 124).

Indications were that, given time, chances were quite good that they would succeed.

Conclusion

Triangulation of Quantitative and Case Studies

Results from the quantitative portion (the CIDA instrument and exam scores) indicated that positive interpersonal experiences and expectations enhance the transfer of technology. Results from the case study (content analysis) portion indicated that definite differences existed between the norms, roles, agendas, and motives of two cultures, but that the potential existed for a constructive third culture to be built because of overall positive affect.

Although the two portions of the study were meant to answer different questions about the same subject, each of the two portions informed the other in two ways. First, the positive affect shown in the case study lent credence to the positive affect found in the answers to the questionnaire. Second, the case study may explain why the Group A scores from the expectation (A-C) scale were significantly lower than the Group B scores.

To begin with, the overall tone indicated by the scores on the expectations (A-C) and feelings (A-D) scales of the CIDA instrument, and by the case study interviews was positive. The case study showed that the students demonstrated considerable admiration and loyalty toward the Mexican-American instructor. Each of the students interviewed commented numerous times on their respect for the instructor. In turn, the instructor expressed his admiration for the work of the students.

Second, the case study may explain Group A's low scores on the expectations scale on the CIDA instrument. In other words, one interpretation that may be forwarded for the disappointment students in Group A expressed with the diesel mechanics program comes from the answers the students gave to the interview questions. This disappointment with the diesel mechanics program may indicate the development of less positive, but more realistic expectations as the students gained experience in the program and the level of technical difficulty of the material increased. That is to say, as time passed illusions were dismantled and expectations became more realistic (as

indicated by the differences between the scores of Group A and Group B). This indicates a conflict in agendas. However, as mentioned earlier, the positive affect that existed between the students and instructor suggested that this conflict would, in time, have been resolved. The third culture at TSI was, as yet, in only a nascent stage.

The purpose of this study was to discover ways in which to improve the transfer of technology between dominant and minority cultures. Results of the study indicated that positive but realistic expectations, interpersonal skills, positive affect, and a positive climate contribute most to the development of the third culture in which the transfer of technology takes place.

Limitations

This study had a number of limitations, both in the quantitative and the case study portions. The quantitative study was limited by the small sample size and the restriction to a vocational setting, which makes generalization to the general population less certain than would a larger sample size and more diverse setting.

Most important to substantiate that a transfer of technology had taken place would be measures of vocational success as defined at a place of employment. Also, English competency scores would help validate the CIDA scales. The qualitative study was limited by losing half the population. In other words, both portions this study were significantly limited by the closing of TSI before all the data were collected.

Conclusion and Implications

The transfer of technology between cultures takes place in the context of third culture building. Cultures are constructed through communication. Communication takes place against a background of interpersonal interactions and both creates and expresses norms, roles, agendas, motives, and climate. This study has aimed at increasing understanding of the mechanisms by which the third culture influences the transfer of technology.

In this study, the transfer of technology was successfully accomplished at TSI. Nevertheless, a number of changes could have been made that may have enhanced the program at TSI both in the areas of results and satisfaction. Information from

intercultural competence and intercultural training literature relates how to understand and work with the differences between cultures in order to make the transfer of technology smoother and more efficient, and to increase the satisfaction of both students and instructors (J. M. Bennett, 1986; M. J. Bennett, 1986; Collier, 1989; Dinges & Lieberman, 1989; Kealey, 1989; Martin, 1986; McCaffery, 1986; Paige, 1986; Ruben, 1989; Spitzberg, 1989).

First, although the field of intercultural competence has not yet resolved the culture-general versus culture-specific debate, in this case culture-specific information would be useful. For example, given that one of the training results at TSI was dealing with supervisors, peers, and customers, very explicit directions could be given for such encounters.

Second, in terms of intercultural training, both knowledge of training goals and of the models for intercultural training would have benefitted TSI. For example, in terms of training goals, cognitive and behavioral goals can be used to give advice to instructors about the intercultural knowledge they could integrate into their programs. Specifically, the

Mexican-American diesel mechanics instructor could present culture-specific content and discuss what can and cannot be accomplished in intercultural encounters. One example of this would be teaching students appropriate question-asking behavior.

Additionally, in terms of training models, an orientation program before classes started would prepare students for more realistic expectations from the program. Also, if intercultural training for the students were added to the orientation curriculum the level and frequency of satisfactory interpersonal interactions would be increased.

Overall, the successful transfer of technology for adults in a cross-cultural situation like TSI depends on the successful creation and negotiation of a third culture. Specifically, adjustments must be made in norms, roles, agenda, and motives. For example, with the conflict in role of teachers as caretakers or as supervisors, each teacher could work out his or her own role with the students, explicitly stating, "This is what we are doing here in this environment. When you go to work, expected and acceptable behavior will be"

Implications for Future Research

Results from these findings suggest three possible objectives for future intercultural communication research. First, this study indicates that the CIDA instruments deserve further testing and development. Second, the written theory and laboratory skills exam scores were useful measures of the transfer of technology for this study. However, a longitudinal study following the students into the workplace would provide additional information about success or failure of the actual transfer of technology. Evaluations of job performance would be a truer measure of the transfer of technology. Finally, studies looking at differences in the development of the third culture and the transfer of technology in different geographical locations would also be valuable.

As shown by the high internal reliability of the CIDA instrument, this study shows two things. First, the construct of the transfer of technology holds good in a vocational as well as a developmental setting. Second, the construct has validity whether the trainers are from the host culture or from the guest culture.

Thus, the transfer of technology does not depend on who is acculturating to a different culture.

This study emphasizes that the third culture is developmental (cf. Metzger, 1987; & Useem, Donoghue, & Useem, 1962) and that positive climate or positive affect is very important. For example, in this group positive affect was so important that in the early stages of the developing third culture, it could override conflicts in norms, roles, agendas, and motives. The relationship of affect to conflict needs more study.

Finally, results from this study indicate that universals may exist in the construct of the transfer of technology. The developing constructive third culture evident at TSI suggests that longitudinal studies conducted in a variety of settings will further clarify and define universals in the process of the transfer of technology.

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APPENDIX A

TABLES

Table 1: Correlations among Ability Measures

Measure (N=16)	C2	C3	C4	C5	C6	C7	C8	C9	C10
Interest in culture (C2)	---	.68***	.67***	.52*	.42	.22	.38	.65**	.16
English competency (C3)	---	---	.80***	.71***	.19	.34	.52*	.44	.04
NV Comm in English (C4)	---	---	---	.50*	.13	.45	.42	.20	.07
Know culture (C5)	---	---	---	---	.12	.15	.23	.55**	.20
Accept customs (C6)	---	---	---	---	---	.24	.37	.20	.29
Enjoy activities (C7)	---	---	---	---	---	---	.69***	.02	.01
Background (C8)	---	---	---	---	---	---	---	.22	.13
Personal commitment (C9)	---	---	---	---	---	---	---	---	.33
Sharing ideas (C10)	---	---	---	---	---	---	---	---	---

*p < .05

**p < .01

***p < .001

Table 2: Correlations among Expectations

Measure (N=16)	E1	E2	E3
Program will be rewarding (E1)	---	.37	.51*
Confident about preparation (E2)	---	---	.83***
Concerned about interacting (E3)	---	---	---

* $p < .05$ ** $p < .01$ *** $p < .001$

Table 3: Correlations among Feelings

Measure (N=16)	F1	F2	F3	F4	F6	F7	F8
Engl speaking instructors (F1) .64**	---	.79***	.48*	.45*	.44*	.18	
Span speaking instructors (F2) .54**	---	---	.75***	.63***	.55**	.33	
Classmates (F3)	---	---	---	.47*	.35	.37	.28
Meeting Americans (F4)	---	---	---	---	.95***	.90***	.31
New customs (F6)	---	---	---	---	---	.91***	.14
Interacting with Americans (F7)	---	---	---	---	---	---	.03
Health (F8)	---	---	---	---	---	---	---

* $p < .05$ ** $p < .01$ *** $p < .001$

Table 4: Correlations among Quantitative Measures
CIDA Scales, Theory, and Skills

Measure (N=16)	Ability	Expectations	Feelings	Theory	Skills
Ability	---	.40	.64**	.24	.32
Expectations	---	---	.65**	.56*	.45
Feelings	---	---	---	.62**	.51*
Theory	---	---	---	---	.86***
Skills	---	---	---	---	---

* $p < .05$ ** $p < .01$ *** $p < .001$

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APPENDIX B
CIDA SCALES

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APPENDIX C
CASE STUDY QUESTIONS

Student Interview Questions

1. When you first started at Texas Schools, Inc. (TSI), are there things that your American instructors at TSI did that were different from what your instructors did in Mexico? Explain.

2. When you first started at TSI, are there things that your Mexican-American instructors at TSI did that were different from what your instructors did in Mexico? Explain.

3. Are there some things you wish your American instructors at TSI did differently? Explain.

4. Are there things you wish your Mexican-American instructors at TSI did differently? Explain.

5. What could TSI do to better meet your educational needs?

Instructor Interview Questions

1. When the bilingual students first started at Texas Schools, Inc. (TSI), were there some things they did differently from American students? Explain.

2. Are there some things you wish your bilingual students did differently? Explain.

3. Are there some things the bilingual students could do to improve the educational climate? Explain.